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BY

ZIGMOND A. ZASADA AND W. A. KLUENDER

LAKE STATES FOREST EXPERIMENT STATION

E. L. DEMMON, DIRECTOR

UNIVERSITY FARM — ST. PAUL, MINNESOTA

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THE FUTURE OF ASPEN IN THE LAKE STATES

By Zigmund A. Zasada and W. A. Kluender,
Forest Economists
Lake States Forest Experiment Station 1/

A Long-overlooked Species

In the pine and hardwood forests of yesterday, aspen was an uncommon and inconspicuous tree. It gained its ascendancy following logging, land clearing, and repeated fires, and now has become the most common tree on the Lake States landscape. In spite of its wide occurrence, it has not been used extensively for commercial purposes until very recently.

The typical aspen forest presents a poor appearance. It is made up generally of trees small-sized, relatively short-lived, and highly subject to decay. It includes considerable dying and down material, and the volumes per acre usually are small. This aspen forest, however, contains a large quantity of usable wood. As other species become scarcer and as the desirable properties of aspen become better recognized, it may be employed more and more by wood-using industries.

Supply is Abundant

Recent estimates made by the Lake States Forest Experiment Station show that the aspen type occupies 20,794,000 acres in the Lake States. By states it is distributed as follows: Minnesota - 7,838,000 acres; Wisconsin - 6,479,000 acres; and Michigan - 6,477,000 acres. This represents over 37 percent of the total forest land area in the three states.

The merchantable volume of aspen saw timber in trees over 9 inches diameter breast high was estimated in 1945 to total roughly six and one-half billion board feet. In addition, there are approximately 17 million cords of high-grade pulpwood and 26 million cords of wood which, under generally recognized utilization standards and production costs, is not suitable for present-day use.

Aspen is one of the very few Lake States species which have increased in volume during the past 10 years. In sawlog volume it has increased by 54 percent, and in pulpwood volume by 66 percent. The large volume increase was not due to growth alone. The lowering of merchantability specifications during the last 10 years has given value to stands previously considered unmerchantable, and it is probable that further lowering of specifications will give value to part of the 26 million cords of presently unusable wood.

1/ Maintained by the U. S. Department of Agriculture, Forest Service, in cooperation with the University of Minnesota.

Of the three lake states, Minnesota produces the best aspen. Approximately one-half of the present usable volume in the Lake States is located here. This state no doubt will continue to be the largest supplier of aspen lumber and will produce most of the high-grade material needed by users such as furniture, veneer, and box industries. Although Wisconsin does not produce on the average as good quality aspen as Minnesota, it provides a better market because of the large number of pulp mills and other wood-using industries within its boundaries. This makes possible a closer utilization of the small timber. Michigan has aspen equal in quality and volume to that in Wisconsin, but as yet has not attained the degree of utilization found in that state. To date Michigan wood-using industries have not attempted to use aspen in large quantities, but much thought is being given to the possibilities of adapting it to their needs.

Although there was a rapid rise in the use of aspen in the Lake States in recent years, particularly during the war period, the species is not being fully utilized. Large quantities are rotting on the stump. At the present time less than 40 percent of the estimated annual growth is being harvested.

Aspen Has Many Good Qualities

Aspen is a rapid-growing, short-lived species. In comparison with other commercial species it is of relatively small size, but under favorable conditions will reach sizes suitable for lumber and railroad ties within 40 to 50 years. This feature is significant because many acres of young aspen will be marketable within the near future.

The wood of aspen has many characteristics of merit. It is fine and uniform in texture, making it easily workable. It is light-colored, has little odor, and does not impart that to food stuffs. For a wood light in weight, it is tough. With changes in moisture content the shrinking and swelling of the wood is small. It has fair nail-holding properties, good gluing qualities, and takes and holds paint well. Aspen can be pulped by any of the standard processes and the pulp is easily bleached.

The adverse qualities of aspen are that the small-size trees will produce only a limited amount of clear, wide lumber. The wood is short-fibered and is low in decay resistance.

Utilization

Aspen is used to a limited extent wherever it grows. In the not too distant past it was looked upon as a poor species, but as its good qualities are becoming recognized, and wood-using plants are becoming adjusted to handle it, thus much fuller utilization is being attained. It is cheaper than competing species, but as these other species become scarcer and as additional markets are found, higher prices can be expected.

Pulp: The best possibilities for large scale utilization of aspen are in the pulpwood field. The prospect of a serious shortage of wood pulp during the war years gave aspen its greatest impetus for this market. Many pulp mills came to rely on it as a local source of wood to augment their more distant and dwindling supplies of spruce and balsam.

In the Lake States most of the aspen used for paper is mixed with the longer fibered coniferous woods pulped by the sulphite process. Leonard Parkinson, paper mill superintendent, Flambeau Paper Company, Park Falls, Wisconsin, in describing the advantages and disadvantages of aspen, says, "The most serious objection to the use of hardwood pulp as a papermaking material is its inferior strength. For year-round use, difficulty in the barking of the wood is also a detriment as the season when the wood barks or strips readily is very short. Offsetting these objections, the hardwoods offer distinct advantages and economies. They are usually cheaper than coniferous species; when cut with coniferous species they insure a higher probability of success in logging operations; they lend themselves readily to pulping and bleaching and in general give relatively higher yields. Where highly purified pulps are required for dissolving or other chemical conversions, hardwoods are sometimes preferred. Hardwoods are particularly suitable to the great bulk of printing papers where strength is secondary to printability."

The paper-manufacturing industry has already made great progress in improving the strength of papers made from short-fibered pulps from aspen and other hardwoods through variations in processing and the use of adhesives and synthetic resins. These developments indicate possibilities for increased aspen utilization in the paper and pulp industry. The Consolidated Water Power and Paper Company at Wisconsin Rapids, Wisconsin, recently manufactured a paper of 85 percent aspen which was used in printing two issues of Life magazine.

The mills in northern Minnesota manufacturing wall and building board are using aspen as the main ingredient in this product. Recent expansion at one of these mills and the present need for housing assures a large demand for aspen pulpwood in Minnesota.

In recent years, aspen fibers have been used to an increasing extent as a base filler for roofing, building and insulating papers, floor coverings, and other similar asphalt products. A large amount of this material is prepared by a mechanical defiberizing process. Because this process is adaptable to small-size and short-length wood, it offers an excellent opportunity for increased utilization of aspen.

The volume of aspen used for pulping purposes in the Lake States during the past 25 years and the percentage this represents of all the woods used is shown in the following table:

Year	Aspen used	Proportion of all species used
	<u>Thousands of cords</u>	<u>Percent</u>
1920	3	0.2
1925	19	1.0
1930	67	4.0
1935	63	4.0
1940	174	9.0
1941	281	13.0
1942	401	17.0
1943	417	18.0
1944	439	18.4

Excelsior: Aspen, because of its toughness, light color, light weight, and freedom from odor, makes an excellent excelsior wood. In years past, basswood was the principal species used for this purpose, but because of scarcity and high prices aspen is rapidly replacing it.

In 1944, approximately 70,000 cords of wood were used in the manufacture of excelsior in the Lake States, the majority of which was aspen. Wisconsin and Michigan are the largest producers because of the location of existing excelsior plants and proximity to the using market.

From the standpoint of aspen management, excelsior is an excellent product in the utilization picture as it uses an abundant supply of small-sized material.

Lumber: The largest present-day use of aspen lumber is in the manufacture of boxes and crating. This is because it meets most of the necessary specifications and in addition is relatively low in cost when compared with other native woods.

Aspen is a good all-around wood for box material because it is light in weight and relatively tough. It is an excellent material for containers for cheese, meat, fruits, and other food stuffs as it is white in color, giving it a clear appearance; it does not impart odors or taste to food, and is excellent for printing.

In Michigan, aspen stands an excellent chance of being used as fruit and vegetable containers in amounts heretofore not considered possible. The producers of these crops are looking forward to a great increase in their production by shipping their produce to areas previously considered out of the normal zone of profitable marketing. Fruit producers in particular feel that these new and distant markets will require a container which will stand handling and shipping better than the conventional basket. This new container may be a veneered aspen strip-bound box.

Aspen had an enormous expansion as a box material during the war years. Lumber restrictions and priorities during this period limited west coast and southern lumber for local manufacturers. Its favorable box-making qualities became known and tested. As a result, many users are now showing a preference for aspen boxes over other woods. If aspen lumber can be produced on a volume basis, well-manufactured, and at a cost sufficiently low that it can successfully compete with woods formerly imported, it is very likely that it will easily hold its own in the box field.

Increasing amounts of aspen lumber are being used for all ordinary purposes in the Lake States. According to a survey made in 1944 by Dr. L. W. Rees, Professor of Forestry at the University of Minnesota, aspen lumber has been used as a building material in Minnesota since about 1916. On farms it has been successfully used in barns, granaries, machine sheds, etc., as rafters, stringers, studding, sheathing, shiplap, and flooring. It was also found that aspen lumber has frequently been used in home construction in small villages and has given good service. Reports from Lower Michigan indicate that during the war years aspen lumber was used in considerable quantities in home construction and repair.

Aspen lumber has some weaknesses which will hinder its use as construction lumber. The small size of aspen logs cannot produce the size lumber generally demanded by the building industry. Aspen lumber is subject to rapid decay when used in contact with the soil or in damp places. This weakness can be retarded through use of preservative treatment; however, the best precaution is not to use it where it will be subject to damp conditions. Because of these adverse qualities, it appears that during the immediate future this lumber will be used mainly in the localities where it is produced.

During the war, many mill work manufacturers were forced to use aspen and other low-grade woods in their plants. Because aspen is white in color and has a good appearance, is easily worked with hand tools, has no resin, and takes paint and enamel well, lumber yard men report that contractors and carpenters willingly accept it as an interior trim and finishing lumber in home construction.

Aspen has an excellent chance for expanded use in interior trim, but it will mean that the better-quality aspen will have to be separated out for this purpose. This will mean that the price of the better-grade material will have to increase.

Furniture manufacturers believe aspen can be used in their industry for plywood cores, shelving, backs, dust separators, juvenile and painted furniture. Also some concerns believe it can be satisfactorily used for venetian blinds. The main drawback to its use in large manufacturing concerns is the present inability of producers to guarantee a large volume of material over a specified period of time. Furniture plants attempt to use as few different woods as possible to maintain a low cost of plant tie-up while machines are adjusted to each species. If aspen could be successfully introduced into one or two large plants, it would no doubt become a stable recognized species for use in furniture.

One large manufacturing concern in Wisconsin is now using large volumes of aspen as a core stock for doors and paneling. This company is able to successfully use aspen of a quality comparable to that used in the box trade. Another company in northeast Minnesota is establishing a sawmill with which it hopes to saw aspen largely for the same purpose.

Aspen lumber can be seasoned without difficulty both by air drying and kiln drying. It is now being kiln dried in large volumes by users who operate their own sawmills. It is probable that aspen lumber will have to be kiln dried to get into the factory uses for which it is adapted.

Both the hardwood and softwood grading rules make provisions for the grading of aspen lumber. Because aspen has been largely used as a box material, it has been sold mainly on a log run grade, No. 4 and Better product of the log, under the softwood rules. The more specialized uses for aspen will require careful grading, and it appears that the hardwood grades will apply better where it is placed into many of these uses. The feeling among many lumber producers and users is that there is a need for the development of grading rules for aspen which will describe its suitability for its various uses.

The following table gives the production of aspen lumber in the Lake States during the last five years:

State	1941	1942	1943	1944	1945
In million board feet					
Minnesota	43.7	58.0	53.8	59.9	51.0
Michigan	8.6	14.6	17.9	28.9	21.3
Wisconsin	14.6	37.7	25.7	34.9	34.6
Total	66.9	110.3	97.4	123.7	106.9
Percent of total Lake States lumber production	5.5	8.8	9.8	10.0	10.4

Other aspen uses: Aspen like most woods has a number of miscellaneous uses. During the war, railroads expanded their use of aspen for ties. In 1944 there were produced approximately 300,000 aspen ties in the Lake States, or 7.3 percent of total production. It is unlikely that aspen will become an important tie species. In treating, some difficulty was experienced in getting it to take a uniform preservative treatment. The amount of aspen that grows to tie size is limited. Timber dealers in northern Minnesota state that they would like to see aspen continued as a railroad tie species.

They feel that the adverse criticism to aspen for ties was brought about by the marketing of large volumes of balm of Gilead as aspen.

In Minnesota there is one factory which uses aspen for match sticks. For use in matches, large diameter clear stock is required since in the manufacturing process the material is first cut into veneer. This company has been having difficulty obtaining the quality of material required and recently has acquired a large quantity of aspen stumpage in the West to augment its Lake States supply.

Some use has been made of aspen for toys and novelties. A few toy manufacturers report that they have experienced difficulty obtaining smooth saw cuts. The resulting fuzzing requires additional time in sanding, the cost of which is often more than if higher quality woods were used.

Aspen posts and fuel wood are used in the immediate area of production. The extent of their use is largely determined by the scarcity of more desirable woods.

Problem of Utilizing Poorer Grades

Aspen is capable of establishing itself and growing on a wide variety of soils, but on some areas it will not produce merchantable timber. Its growth and yield depends upon the soil productivity and the number of times the area has been burned. On about three million acres of good sites, usually clay loam and silt loam soils, aspen can be carried to its longest growing rotation. In 50 to 60 years it will reach sizes suitable for lumber, veneer, and railroad ties. On medium sites, mostly sandy loam soils, which are estimated to add up to 11 million acres, aspen will reach small log and pulpwood size in 40 to 50 years. Stands carried beyond 50 years begin to deteriorate rapidly. Poor sites, the droughty, sandy soils, and the areas which have been burned over repeatedly, are estimated at 7 million acres and here aspen will make only cordwood, and frequently will deteriorate before reaching the size desired by pulp mills.

The problem is not to find additional use for aspen of sawlog size and quality or good pulpwood material; it is rather to find profitable uses for the small timber produced on the medium and poor sites.

Need to Improve Logging and Milling Methods

Under standard methods, aspen logging has always been a narrow margin operation. Consequently, most of the aspen cutting had to be confined to the better grade and more accessible stands to be profitable. How far small aspen can be used for pulp, paper, plastics, etc., will depend on how cheaply it can be harvested. There is therefore a great need for improvement in logging practices.

During the war years, progress was made in methods of logging, such as use of the chain saw. Power loading and unloading units have been developed. Tractors and arch skidders are now being used. Yet with all these advances the economical logging of small-sized aspen has not yet been attained. The increasing interest of logging companies to find ways and means of mechanizing operations gives reason to believe that such methods will be developed.

A logging system now in use by a few aspen loggers has reduced some of the log handling. This provides for tree length skidding, bucking the bolts on the skidways with a slasher saw, and conveyor loading directly onto trucks.

Some thought has been given to producing aspen chips in the woods for use by pulp mills and for felt wood. Manufacturers of equipment feel that the wood-chipping machines now available can be operated on a portable basis. Transportation and storage of wood chips appear to be the limiting factors in this process. Chipping in the woods, if it can be worked out as a continuous year-round woods operation, will reduce the actual time between stump and manufacture, reduce heavy investments in wood inventories at the mill, and definitely provide for closer utilization in the forest.

The largest part of aspen lumber is produced by small portable sawmills. The small mill, although adapted to sawing small timber, has several objectionable features which must be overcome before fuller utilization is possible. Large volumes of lumber have been poorly manufactured by portable mills. Lumber around small mills is often carelessly handled. The present small mills are not adapted to mass production required if aspen utilization is to be expanded. Production costs and quality of lumber from portable mills usually prevent the lumber from getting into the higher grade markets.

The type of mill which at present holds promise for mass production of aspen lumber from small logs is the "center split horizontal band resawmill." Several of these mills are now in operation in the Lake States. Accurate sawing, large volume production, high recovery (large overrun) and low cost of operation are possible in this type of mill. Possible objections to this type of mill are that it cannot be easily moved; it needs a large supply area; and sawing for lumber quality is sacrificed for volume. This mill, however, is a type that can supply industries needing large volumes of lumber.

Must Grow Better Aspen

The demand for aspen has been built on utilizing the large size, better-quality timber. This should direct the interests of timber owners to forest management practices which will produce high quality material, at least on the best sites. The Lake States Forest Experiment Station has been carrying on research work in aspen management during the past 20 years. Those studies show that the final cut of aspen must be properly timed to get successful reproduction. The quality and yields of the stands can be improved by early thinnings and partial cuts.

Large owners may find intensive management of all their aspen lands impractical at this time. They could, however, classify their areas as to site and age classes and build up information for a cutting policy for extensive management in order that good site material may not be harvested too early and medium and poor site material may not be allowed to deteriorate. Small owners should be interested in intensive management in order that their lands will yield the greatest possible return per acre.

Aspen Values Increased

During the war period, aspen stands brought a good return to land owners and timber producers. Stumpage rates for sawlogs ran \$2.50 to \$5.00 per M board feet and for pulpwood \$0.50 to \$2.00 per cord. Many good quality stands of large-sized trees brought up to \$7.00 per M board feet and up to \$3.50 per cord. The ceiling price on aspen lumber, random length, No. 4 and better, is \$40.00 per M board feet. Aspen pulpwood ceiling prices are \$10.00 per cord for unpeeled wood and \$13.50 per cord for peeled wood.

Intensive Research Required

Although considerable advance has been made in the utilization of aspen, further research is required if the resource is to be fully used. There is need for a survey which will give the available timber volumes for the various industrial units in the states and which will appraise the quality and the growth possibilities of the timber stands. State and federal forestry agencies must work on the aspen management problem in order that the best possible crops can be raised. The Forest Products Laboratory, state institutions, and industries, must concentrate on the utilization problems. Public research agencies must cooperate with industry on reducing costs in timber harvesting and manufacture and in developing markets.

The Outlook

In the last ten years aspen has gained entrance to many new fields of use and with intelligent guidance, this trend can increase. The drain will likely be heaviest on the limited quantity of high-grade material. More consideration must be given to the potential use of the medium and low-quality stands. To encourage its use, cooperative efforts are necessary to develop low cost and profitable production methods. This includes the logging, transporting, and milling phases. High-quality aspen, suitable for furniture and wood working use, will command higher prices. This, of necessity, will require that aspen be graded and treated like high-quality hardwoods. To meet this standard, the practice of marketing balm of Gilead, cottonwood, and low-quality basswood, as aspen, must be abandoned. To assure

maximum use and proper forest management of our present aspen stands, timber owners and industry will have to give serious consideration to integrated utilization. Certain grades of aspen now cut and used in boxes, pulp, and crating are far more valuable as veneer bolts or furniture and interior trim lumber.

Aspen has a chance of becoming one of the most valuable sources of raw material for Lake States wood-using industries.

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